T10D02 – 10.1 Introduction

Name …….

1. 10.1.1 Describe the features of a homologous series. (2)
   a. Show (using structures) how the homologous series differs by a CH_2:

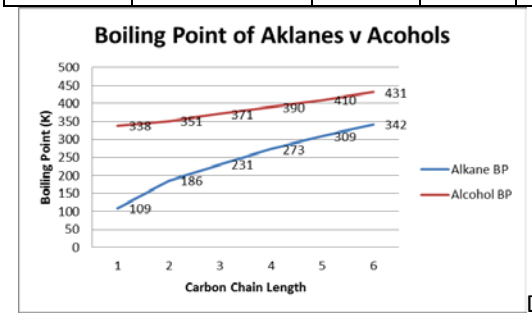
   b. Show how they are represented by the same formula:

   c. Give an example of how a homologous series demonstrates gradation of physical properties:

   d. Why would homologous series demonstrate similar chemical properties?

2. 10.1.2 Predict and explain the trends in boiling points of members of a homologous series. (3)

Alkane	Molecular Formula C_nH_{2n+2}	C atoms	M.P. (K)	B.P. (K)	B.P. Increasing	State at STP	Alcohol	Molecular Formula $C_nH_{2n+2}O$ ($C_nH_{2n+1}OH$)	B.P. (K) @ STP
Methane	CH_4	1	91	109		Gas	Methanol	CH_3OH	338
Ethane	C_2H_6	2	90	186		Gas	Ethanol	C_2H_5OH	351
Propane	C_3H_8	3	83	231		Gas	Propan-1-ol	C_3H_7OH	371
Butane	C_4H_{10}	4	135	273		Gas	Butan-1-ol	C_4H_9OH	390
Pentane	C_5H_{12}	5	144	309		Liquid	Pentan-1-ol	$C_5H_{11}OH$	410
Hexane	C_6H_{14}	6	178	342		Liquid	Hexan-1-ol	$C_6H_{13}OH$	431



Describe (above) how the oil refinement process can demonstrate this BP trend:

3. 10.1.3 Distinguish between empirical, molecular and structural formulas. (2)
   a. Give one example of the difference between empirical and molecular formulas:

   b. Draw an example of each of the following:

Type	Alkane	Alkene	Alkyne	Cyclic H.C.	Aromatic H.C.	Branched H.C
Example						

   c. Draw an example of each of the following:

Type	Full Structural	Condensed Structural	Stick Model	Stereochemical
Example				

4. 10.1.4 Describe structural isomers as compounds with the same molecular formula but with different arrangements of atoms. (2)
   a. Using the example of a C_4H_{10} draw the possible isomers:

   b. What differs in isomers?

5. 10.1.5 Deduce structural formulas for the isomers of the non-cyclic alkanes up to C6. (3)
6. 10.1.6 Apply IUPAC rules for naming the isomers of the non-cyclic alkanes up to C6. (2)

# C in chain	Stem	Example	Name
1			
2			
3			
4			
5			
6			

7. 10.1.7 Deduce structural formulas for the isomers of the straight-chain alkenes up to C6. (3)
    a. Draw the possible isomers for the alkenes of butene, pentene, and hexane:

8. 10.1.8 Apply IUPAC rules for naming the isomers of the straight-chain alkenes up to C6. (2)
9. 10.1.9 **Deduce structural formulas** for compounds containing up to six carbon atoms with one of the following functional groups: alcohol, aldehyde, ketone, carboxylic acid and halide. (3)
10. 10.1.10 **Apply IUPAC rules** for naming compounds containing up to six carbon atoms with one of the following functional groups: alcohol, aldehyde, ketone, carboxylic acid and halide. (2)
11. 10.1.11 Identify the following functional groups when present in structural formulas: amino (NH2), benzene ring ( ) and esters (RCOOR). (2)

Name	Functional Group	Suffix	Example
Alkane			
Alkene			
Alcohol			
Amine			
Aldehyde			
Ketone			
Carboxylic acid			
Amide			
Ester			
Nitrile			

Name	Functional Group	Suffix	Example
1 carbon side chain			
2 carbon side chain			
3 carbon side chain			
Haloalkane			

a. Naming of esters is difficult, IB requires that you identify esters, no necessarily name them. We'll revisit them later

b. Draw the following amides:

Primary amide	Secondary amide	Tertiary Amide

c. Draw the following amines:

Primary amine	Secondary amine	Tertiary Amine

d. Benzene rings are very common in organic chemistry, list their properties and draw two different ways of representing their structures:

e. In nomenclature of organic compounds, where does the numbering begin?

f. Often there are many different functional groups, side chains, and structural features, how does this affect the name of compounds?

12. 10.1.12 Identify primary, secondary and tertiary carbon atoms in alcohols and halogenoalkanes. (2)

a. The activity of a functional group is often influenced by its position in the carbon chain, draw the structure of each of the following alcohols and describe why it's considered to be primary, secondary, or tertiary:

Type	Primary alcohol	Secondary alcohol	Tertiary alcohol
Structure			
Explanation			

13. 10.1.13 Discuss the volatility and solubility in water of compounds containing the functional groups listed in 10.1.9. (3)

a. What two (main) factors affect the physical properties of a compound?

b. What is meant by volatility (volatile)?

c. What affects the volatility of a compound?

d. How does the functional group impact the volatility based on their intermolecular forces (draw the trend)?

e. What affects the solubility of a compound?

i. In order to demonstrate which functional groups interact with water through hydrogen bonding, complete the following table and draw each molecule to show why their structure allows this interaction:

Soluble	**Slightly soluble**	**Insoluble**
Alcohols	Aldehydes	Haloalkanes
Carboxylic Acids	Ketones	Alkanes
Amines	Amides	Alkenes
	Esters	